ECS10 Final Exam Spring 2013

Open Book, Open Notes, no computers or electronic devices
Answer programming questions on a separate page. Write your name on all pages.

For the first nine questions below, state what will be printed by the programs.

1) (5 points)
```
def third(n):
    return n//3
print(third(third(30)))
```

2) (5 points)
```
a = 28
b = a % 6
c = b % 3
print(c)
```

3) (8 points)
```
def double(a):
    a = 2*a
a = 3
double(a)
print(a)
print(double(a))
```

4) (5 points)
```
def double_list_1(list):
    for i in range(len(list)):
        list[i] = 2*list[i]
list = [1, 3, 7]
double_list_1(list)
print(list)
```

5) (5 points)
```
def double_list_2(list):
    for num in list:
        num = 2*num
list = [2, 4, 9]
double_list_2(list)
print(list)
```

There are questions on the back of this page!

6) (6 points)

```
def gcd(a, b):
    if (b < a):
        a, b = b, a
    if (a == 0):
        return b
    else:
        c = b % a
        return gcd(c, a)
print(gcd(100, 36))
```

7) (7 points)

```
def check(x):
    if x > 1:
        if x > 2:
            return 4
        elif x > 1.5:
            return 3
        else:
            return 2
    return 1
print(check(check(1.9)), check(0.5))
```

8) (5 points)

```
y = 0
x = 7
while x > 2:
    y = y + x
    x = x - 2
print(x, y)
```

9) (6 points)

```
a = True
b = False
c = False
print((a or b) and not(b or c))
print(a and b and c)
```

10) (8 points) In the code below, what letters have a chance of being printed, and what is the probability of each such letter being printed?

```
x = random()
y = 2*x
if y < 0.2:
    print("A")
elif y < 0.8:
    print("B")
elif y < 3:
    print("C")
else:
    print("D")
```

Answer the following programming questions on a separate sheet, with your name on it.

11) (20 points) A program is supposed to get from the user a chemical formula for a compound consisting of hydrogen, carbon, and oxygen, like H2O, C2H5OH, or C8H18, and compute and print its molecular weight. To aid in this task, write a function to get an input formula from the user, and return it (as a string) to the main program. The function should be robust to user error, by first checking if the user's input is valid, and continuing to prompt for a valid input until the user enters a valid formula, which is then returned. A valid formula can contain only the upper case letters "H", "C", and "O" and the digits "0" through "9". In addition, a valid formula must begin with "H", "C", or "O".

12) (20 points, taken from problem 5 on page 463 of our textbook.) Computer scientists and mathematicians often use numbering systems other than base 10. Write a program that allows a user to enter a number and a base and then prints out the digits of the number in the new base. Use a recursive function `baseConversion(num, base)` to print the digits.

Hint: Consider base 10. To get the rightmost digit of a base 10 number, simply look at the remainder after dividing by 10. For example 153%10 is 3, the lowest order digit. To get the remaining digits, you repeat the process on 15, which is just 153//10. This same process works for any base. The only problem is that we get the digits in reverse order (right to left).

Write a recursive function that first prints the digits of `num//base` and then prints the last digit, namely `num%base`. You should put a space between successive digits, since bases greater than 10 will print out with multi-character digits. For example, `baseConversion(245, 16)` should print `15 5`.